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ABSTRACT

It has long been assumed that Part 3 of the National Boards, which stresses patient management and clinical problems, is a valid measure of "clinical competence" for doctors. These authors, challenging this premise, devised a study to analyze which components of medical school achievement are most predictive of Part 3 performance. Their correlation matrix incorporated 46 computer generated variables. Subjects were 152 students attending Jefferson Medical College who had completed all three examinations as candidates for National Board certification. Results showed that 15 measures had a significant relationship with Part 3 performance. The authors found that measures of factual medical knowledge were better predictors of Part 3 performance than were performance-oriented or computer-referenced measures and agreed with previous researchers that patient managemental problem measures, though intuitively appealing, are found both weak and ambiguous when subjected to rigorous statistical analysis. (BJG)

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CLINICAL COMPETENCE AS MEASURED BY THE NATIONAL BOARDS, PART III

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Certification by the National Board of Medical Examiners requires successful completion of the Part I examination, generally taken at the end of the second year, the Part II examination which may be taken in the Fall or Spring of the senior year and the Part III examination taken during March of the internship. The first two examinations measure factual knowledge in basic and clinical medical sciences; the Part III examination is said to measure "clinical competence" with patient management problems and questions requiring interpretation of clinical material presented in pictorial and graphic form.

It is the policy of the National Board not to release reports of individual student performance on the Part III examination to the school of graduation; consequently, there is a paucity of information in the literature about predictors of Part III performance. Consequently, as part of an ongoing longitudinal project to collect data on the career choices and on the performance of our graduates on certification examinations during postgraduate training**, a study was undertaken to determine what components of medical school achievement are most predictive of Part III performance.

METHOD

Jefferson Medical College requires that its students demonstrate growth in knowledge, skills and attitudes both at the end of each course, and at end of the basic science and clinical science phases of the curriculum. The Part I and Part II examinations of the National Board are used as the sophomore and senior comprehensive examinations in the area of knowledge. Successful completion of these examinations is required for promotion into the third year and eventual graduation. A study was made on 152 members of the class of 1971 who completed all three examinations as candidates for National Board certification. A correlation matrix incorporating 46 predictor variables was generated with a Honeywell DDP-516 computer. The 15 predictor variables correlating most closely with Part III performance are listed in descending order of correlation in Table I; the mean and standard deviation of each predictor are also included. Factor analysis of the intercorrelation matrix produce a multiple regression equation (Table II) for prediction of Part III performance.

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**Written permission is given by the students in their senior year to request Part III grades.

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RESULTS

The fifteen measures having the highest relationship with eventual Part III National Board performance (Table I) are all significant at less than the 0.01 level. Of interest is the strength of the relationship between cognitive achievement in the Medicine subtest of the Part II examination and Part III performance; if this relationship is corrected for attenuation according to the method described by Thorndike (1), the correlation coefficient increases to 0.63. Also of interest is the relationship between the introductory clinical course taken during the second year of the medical curriculum and the criterion of clinical competence completed near the end of the internship, i.e., Part III National Board; the second-year course is exclusively didactic yet it shows a stronger relationship to criterion performance than do the clinical clerkships. Similarly, first-year biochemistry achievement has a more striking relationship with Part III performance than clinical proficiency in fourth-year pediatrics.

Factor analysis of the matrix produced a multiple regression equation (Table II) which explained forty-five percent of the variation in Part III score.

no examination of the matrix

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DISCUSSION

Clinical competence is a composite of knowledge, data gathering, judgement and attitude. At best, the Part III National Board examination measures the first three components of this composite. The National Board of Medical Examiners state that the Part III examination measures not so much knowledge but rather "clinical competence"; this thesis is not fully supported by results of this investigation. Earlier measures of factual medical knowledge rather than performance-oriented and/or criterion-referenced measures of clinical ability were better predictors of eventual Part III performance in the population studied; this appears to be true even after one considers the relative reliability of intramural clinical evaluation.

Approximately fifty percent of the Part III examination is composed of patient management problems. These problems are widely used currently in licensure and specialty certification examinations despite the absence of a clear body of evidence in the literature as to their validity. Schumacher (2) has shown that the patient management problem section of a specialty board examination in Internal Medicine showed no performance increment after two years of residency training in that specialty. The same observation was made five years earlier by Miller and his group at the University of Illinois working with the American Board of Orthopedic Surgery (3). He also noted that while cognitive achievement on the multiple choice section of the Orthopedic examination increased as a function of number of years of specialty training, performance on the patient management problem section showed no such increment and in fact was totally unrelated to the time during specialty training when the in-service examination was written. These findings, reported by independent investigators in different areas of graduate medical training, are indeed perplexing. It is difficult to understand why two to four years of responsibility for patient management would not result in at least the same increment in performance on patient management problems (if they indeed measure clinical competence) as in the cognitive data base in a specialty. Further, Huth (4), in commenting on Schumacher's study, points out that concurrent validation would be more appropriate for these examinations than operational validation using a comparison of criterion groups. Such a study of patient management problems employing the method of concurrent validation was carried out by one of us (J.G.) at the University of Illinois (5); no difference was found between performance of well-trained physicians functioning in a university medical center and medical students on patient management problems dealing with patients having urinary tract infection. In addition, the physicians were more thorough in their pursuit of a differential diagnosis on the patient management problem than they were in the actual clinical situation.

Patient managemental problems have intuitive appeal both in overall design and face validity. When they are subjected to rigorous statistical analysis however, the results of the present investigation are consonant with studies cited above: currently available studies on their validity are at best weak, and in some cases ambiguous. Patient management problems appear to measure a physician's intent rather than what his behavior would be in actual performance. Evidence available at present raises some doubts as to whether they are a "valid" index of clinical competence. In addition, traditional measures of psychometric "quality" are less easily applied to patient management problems than to other objective item formats.

Patient management problems probably have their greatest potential usefulness as an instructional aid; in this respect they share most of the advantages and disadvantages of programmed instruction and computer-aided instruction. They are gaining increasing popularity as a significant component of many licensure and certification examinations on the supposition that this format has some innate ability to measure something different than that measured by other formats of objective examination. The results of this investigation, and those cited above, clearly do not fully support the thesis that patient management problems sample a unique aspect of clinical ability. The content validity of patient management problems is often subject to debate, present data as to their concurrent validity is ambiguous, ill-defined and difficult to interpret, and evidence of their predictive validity needs still to be collected. Good performance on a patient management problem will not predict real-life performance. If patient management problems principally sample a cognitive data base, this information can be obtained with greater reliability and lesser complexity with more traditional formats of objective examination. In the absence of a consensus as to the soundness of the psychometric foundation of these measuring instruments, one wonders whether their continued use in examinations that result in a decision on a candidate's licensure and/or certification continues to be entirely justified. This study strengthens the suggestion made by Huth (4) that much more extensive concurrent validation of these instruments must be done to insure that patient management problems are indeed measures of competence in clinical medicine, i.e., that they measure what they portend to measure.

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TABLE I

Predictors of Part III Performance	Correlation With Part III (r)	Predictor Mean	Predictor Standard Deviation
National Board - Medicine	0.59	82.67	4.54
Introduction to Clinical Medicine-second year	0.51	78.30	4.97
National Board - Obstetrics & Gynecology	0.48	83.07	4.32
National Board - Pediatrics	0.48	83.42	4.64
Medicine - third year	0.48	80.55	4.15
National Board - Pathology	0.47	81.11	5.73
Pathology - second year	0.46	32.22	4.86
Clinical Pathology - second year	0.45	79.46	4.90
Surgery - third year	0.45	83.26	5.11
National Board - Surgery	0.44	82.76	4.84
National Board - Microbiology	0.40	81.64	4.86
Biochemistry - first year	0.40	82.79	5.80
Physiology - first year	0.36	82.21	5.55
National Board - Pharmacology	0.35	82.87	5.47
Pediatrics - third year	0.34	81.22	6.93
Composite Part III Predictors:			
National Board - Part II total score	0.58	82.60	3.56
Cumulative 4 year medical school average	0.51	83.35	2.91

TABLE II

Multiple regression equation for prediction of Part III score:

$$\text{Part III grade} = A + 0.271\,x_1 + 0.114\,X_2 + 0.131\,X_3 + 0.074\,X_4 + 0.071\,X_5 + 0.094\,X_6 - 0.163\,X_7$$

A = regression constant = 33.37
X_1 = National Board Medicine subtest
X_2 = Biochemistry - first year
X_3 = Introduction to Clinical Medicine - second year
X_4 = Preventive Medicine - second year
X_5 = Pediatrics - fourth year
X_6 = Surgery - third year
X_7 = Microbiology - second year

Percent Part III variation explained by multiple regression equation = 45.11% (r=0.68)